ABSTRACT

A screen out is a blocking of the fracture path caused by bridging the path or accumulation of the proppant inside the fracture, clumping or lodging of the (solid particles) proppant across the hydraulic fracture width that causes to restrict formation fluid to flow into the hydraulically fractured formation. To avoid the screen out happening needing to save fracturing fluids, hydraulic horsepower.

Conditions that leading to screen out during the hydraulic fracturing job in a well, such as, ①the ratio between the fracture widths to particle diameter that called (β), ②proppant concentration, ③ wall roughness. The effects of these factors are investigated experimentally in the present work by building an apparatus that meet the shape of the real hydraulic fracture.

The plugging time were measured and monitored through glass windows on both sides of the apparatus to follow the behavior of the proppant inside the fracture during the flow of the fracturing fluid or when the proppant plugs the fracture.

To study the effect of the fracture wall roughness on the screen out phenomena, apparatus was build to get two different fracture shapes, to meet the real fracture wall in reality.

Through the relation between the different proppant concentration and the plugging time, one can indicate on the graph the plugging region and non plugging region for different values of β, proppant concentration and fracture shape, in order to avoid the screen out.

The results of the plugging time, for different conditions were analyzed by using SPSS software.

The results were modeled by using the neural network method. An artificial neural network model was used through the fitting tools of MATLAB. This neural network model can exactly predict the time for plugging inside hydraulic fracture versus proppant concentration and β value.

During designing the hydraulic fracture, the values of β were very important factor that can lead to screen out, through the results found that when β=1, the screen out happened very fast even at low proppant concentration, but for β=2, 3 and 4 the screen out depends on the proppant concentration and fracture shape. For β=5 it was found that, there is no screen out occurring for wide range of proppant concentration.

The effect of hydraulic fracture wall roughness is important when effect the speed of the suspension when passing through the fracture.